IN THE CLAIMS:

1. (Currently amended) A method for remotely sensing subsurface objects and structures, comprising:

a. selecting one or more input parameters indicative of a host site environment of a host at a first location and a subsurface object site environment of a subsurface object that is beneath a surface at a second location, wherein said host ~~and subsurface object~~ site environment ~~are~~ is naturally heated to a depth below said subsurface object;

~~b. surveying said host and said object site by:~~

~~simulating the temperatures of said host and said object site;~~

~~calculating the thermal inertias of said host and said object site; and~~

~~computing the twice-daily and bi-yearly temperature spreads of said host and said object site;~~

b. using said one or more input parameters in a heat-transfer calculation, calculating at least two sensing times, either twice daily for a daily cycle for objects no deeper than three feet, or twice yearly for a yearly cycle for objects deeper than one foot, wherein a first sensing time of said at least two sensing times is when an object-site temperature is maximum and a host-site temperature is distinguishably less, and wherein a second sensing time of said at least two sensing times is when an object-site temperature is minimum and a

host-site temperature is distinguishably more; such that the temperature when said object-site temperature is maximum minus the temperature when said object-site temperature is minimum, referred to herein as the object site temperature spread, is distinguishably more than a host-site temperature spread;

~~c. determining whether the thermal inertia of said object site is distinguishable from that of said host;~~

~~d. changing the environment of said host and said object site if the temperature spread of said object site is not distinguishable from that of said host;~~

~~e. repeating steps a-d until said object site is distinguishable from that of said host;~~

~~f~~ c. ~~scanning said host and said object site at different times with two different IR wavelengths and recording a spatial sequence of dual-band IR images~~ sensing, at said first sensing time, when said object site temperature is maximum, one or more wavelengths from each of two different thermal infrared (IR) wavebands, wherein one of said IR wavebands comprises a range from about 3 microns to about 5 microns and the other of said IR wavebands comprises a range from about 8 microns to about 12 microns, and recording a spatial sequence of dual-band IR images;

d. sensing, at said second sensing time, when said object site temperature is minimum, said object site with said IR wavebands, and recording another spatial sequence of dual-band IR images;

~~g~~ e. calculating (using an image processing code) signal ratios and differences to form temperature, emissivity-ratio and corrected-temperature maps;

~~h~~ f. co-registering ~~,~~ said corrected-temperature ~~and twice yearly or twice daily~~ maps to form a first sensing time object-site corrected maximum temperature map and a second sensing time object-site corrected minimum temperature map and subtracting said second sensing time object-site corrected minimum temperature map from said first sensing time object-site corrected maximum temperature map, to form co-registered object-site temperature-spread maps with said corrected-temperature maps;

~~i~~ g. correcting said co-registered temperature maps and said co-registered temperature-spread maps by removing and replacing apparent thermal patterns with spectral differences in either of said thermal IR wavebands;

~~j~~ h. removing host-site irregularities and foreign-object ~~foreign object~~ thermal clutter from said temperature-spread maps;

~~k~~ i. determining object location, size, shape and orientation ~~size and shape~~ from said temperature maps;

~~l~~ j. determining object, thickness, volume, and depth information from said temperature-spread maps; and

~~m~~ k. providing a 3D display of said object-site temperature maps and said object-site temperature spread maps.

2. (Currently amended) The method of claim 1, wherein said host site environment and said subsurface object site environment are located from data selected from the group consisting of aerial photos, satellite imagery and site maps that include information selected from the group consisting of surface conditions, soil type, vegetation, geology, meteorology and topography.

3. (Currently amended) The method of claim 1, wherein said host site environment is selected from the group consisting of rock, pavement, concrete, gravel, sand, soil, mud, and water.

4. (Currently amended) The method of claim 1, wherein said ~~object~~ thermal clutter is selected from the group consisting of a shadow, a track, a stain, disturbed terrain, a hole, vegetation, a foreign object, foreign material, foreign soil, water, cool air pools and roughness variations.

5. (Currently amended) The method of claim 1, wherein the step of simulating the temperatures of said host and said object site is carried out with an ~~iterative surface-climate~~ energy budget ~~(SCEB) code~~ equation.

6. (Currently amended) The method of claim 5, wherein said ~~SCEB code~~ energy budget equation inputs a plurality of environmental variables to calculate the surface temperature of said object site.

7. (Currently amended) The method of claim 1, ~~wherein~~ further comprising removing surface clutter ~~is eliminated~~ by separating temperature data from spatially-varying surface-emissivity data, to obtain true, time-varying temperature-difference values at scanned points of said object area, from a plurality of points in space and time.

8. (Currently amended) The method of claim 1, wherein ~~subsurface~~ said host-site irregularities and foreign-object thermal clutter is ~~eliminated~~ removed by separating first thermal inertia data for normal, undisturbed host and targeted-object materials, from anomalous thermal inertia data for disturbed host or foreign-object materials, characterized by their depths, volumes and physical features, unlike the targeted object and host material, to obtain true, spatially-varying thermal-inertia differences which characterize the subsurface targeted-object site, from a plurality of points in space and time.

9. (Currently amended) The method of claim 8, wherein ~~separating surface temperature data from spatially-varying surface emissivity data is achieved~~ said first thermal inertial data is separated from said anomalous

thermal inertia data by using the following temperature ratio equation to obtain a temperature map:

$$[SWB/LWB]=[(\varepsilon_5/\varepsilon_{10})(T/T_o)^5];$$

$(T/T_o)^5=(S/S_{av})/(L/L_{av})$, where S is the short wavelength intensity, ~~S_{AV}~~ S_{av} is the average value of the pixels in S, L is the long wavelength intensity and L_{AV} is the average value of the pixels in L.

10. (Currently amended) The method of claim 9, wherein ~~separating surface temperature data from spatially-varying surface emissivity data is further achieved by~~ said first thermal inertial data is separated from said anomalous thermal inertia data by using the following emissivity-ratio equation to obtain an emissivity ratio map:

$$[(LWB)^2/(SWB)] = (\varepsilon_{10})^2/(\varepsilon_5) = \varepsilon \;;$$
$$\text{E-ratio} = (L/L_{av})^2 / (S/S_{av}).$$

11. (Currently amended) The method of claim 10, wherein determining whether an object exists ~~in said host material,~~ under said surface of said second location comprises comparing said temperature map~~,~~ with said emissivity-ratio map~~,~~ to observe heat flow anomalies generated by the subsurface object, host material or foreign-object, and remove unrelated emissivity, or reflected signals, forming clutter.

12. (Original) The method of claim 10, wherein diurnal or seasonal temperature spread, for said corrected temperature maps, is used to distinguish bulk thermal properties (such as thermal inertia) of said object within the host material, from bulk thermal properties (such as thermal inertia) of an equal volume of said host material.

13. (Currently amended) The method of claim 1, wherein said ~~scanning~~ sensing comprises taking images at specified times, based on ~~the Surface Climate Energy Budget temperature~~ simulations carried out with an energy budget equation.

14. (Currently amended) The method of claim 13, wherein said images ~~in said sequence~~ are ~~typically~~ taken ~~at midday (near noon),~~ before sunset and ~~after midnight (~~before dawn~~),~~ to detect ~~shallow~~ said objects that are no deeper than three feet.

15. (Currently amended) The method of claim 13, wherein said images ~~in said sequence~~ are ~~typically~~ taken during the summer or autumn ~~(September or October),~~ and during the winter or spring ~~(March or April),~~ to detect ~~deep~~ said objects that are deeper than one foot.

16. (Currently amended) The method of claim 1, wherein said ~~scanning~~ sensing is performed with at least the same number of detectors as the number of ~~scanned~~ sensed wavelengths.

17. (Canceled) The method of claim 1, wherein said scanning occurs for at least two different infrared wavelength bands comprising a long wavelength band ranging from 8-12 micrometers and a short wavelength band ranging from 3-5 micrometers.

18. (Original) The method of claim 1, wherein said subsurface objects are selected from the group consisting of hollow, or semi-empty objects and structures which typically have less thermal inertia (resistance to temperature change) than their surroundings of undisturbed earth.

19. (Original) The method of claim 1, wherein said subsurface objects are selected from the group consisting of solid, or semi-solid objects and structures which have more thermal inertia (resistance to temperature change) than their surrounding host material.

20. (Currently amended) A thermal imaging method to detect subsurface objects or air gaps, comprising:

using an energy budget equation to calculate a first imaging time and a second imaging time;

imaging two different infrared (IR) wavelength bands ~~a~~ at said first imaging time from a first location and a second location to obtain a first temperature map;

imaging said two different IR wavelength bands ~~a~~ at said second imaging time from said first location and said second location to obtain a second temperature map;

combining said first temperature map and said second temperature map to obtain a first temperature spread at said first location and a second temperature spread at said second location; and

comparing said first temperature spread with said second temperature spread to determine whether an object or structure is located beneath said first location or said second location.

21. (Previously presented) The method of claim 1, wherein said subsurface objects and structures comprise a fault located in a structure selected from the group consisting of a bridge deck, a pipe, a sewer, a retaining wall, a building structure and a semiconductor chip.

22. (Previously presented) The method of claim 1, wherein said subsurface objects and structures comprise at least one landmine.

23. (Previously presented) The method of claim 1, wherein said subsurface objects and structures comprise a water resource.

24. (Previously presented) The method of claim 1, wherein said subsurface objects and structures comprise an underground tunnel.

25. (Previously presented) The method of claim 1, wherein said subsurface objects and structures comprise corrosion.